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THE
BUREAU OF CHEMISTRY

of the

UNITED STATES DEPART-
MENT OF AGRICULTURE

ORGANIZATION
ENFORCEMENT OF FOOD AND DRUGS ACT
ENFORCEMENT OF TEA ACT
RESEARCH WORK



UNITED STATES DEPARTMENT OF AGRICULTURE
DEPARTMENT CIRCULAR 137 *Rev. 1924*

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THE FEDERAL BUREAU OF CHEMISTRY.

GROWTH.

The Bureau of Chemistry of the United States Department of Agriculture has grown from a small division, organized in 1862, with a staff of four or five men, to a bureau employing some 650 people, about half of whom are chemists, bacteriologists, microscopists, engineers, and inspectors, granted an annual appropriation of over \$1,250,000 for law enforcement and for research work of practical value to the country.

FUNCTION.

The function of the Bureau of Chemistry is twofold. In the first place it enforces the provisions of the Food and Drugs Act, the Tea Act, and the Naval Stores Act which establishes standards for and regulates interstate commerce in rosin and turpentine, and cooperates in the enforcement of the Insecticide and Fungicide Act. At the same time it conducts investigations arising in connection with its regulatory work, and continues to serve the purpose for which it was originally established, the study of chemical problems pertaining to agriculture, as well as those of the industries utilizing agricultural products.

ORGANIZATION.

At the head of the organization are the Chief and the Assistant Chief of the Bureau, who are responsible for the administration of the Food and Drugs Act, the Tea Act, and the Naval Stores Act, and exercise general supervision over the research work. Twenty laboratories and three offices in Washington develop facts upon which the decisions and policies of the Bureau are based, recommend methods for attacking regulatory problems, and conduct scientific investigations.

For administrative purposes in the enforcement of the Food and Drugs Act, the country has been divided (fig. 2) into three inspection districts—the Eastern, with headquarters in New York, the Central, with headquarters in Chicago, and the Western, with headquarters in San Francisco. These districts are further subdivided into inspection territories, with a station, provided with a force of chemists and inspectors, at an important trade center and port of entry within each territory, as shown in the map (fig. 2). While the work of the stations is for the most part regulatory, some time is devoted to the solution of research problems which come to the attention of the chemists in the course of their enforcement of the law.

REGULATORY WORK.

By far the greater part of the activities and funds of the Bureau are devoted to the enforcement of the Food and Drugs Act. This act forbids the importation, the shipment in interstate or foreign commerce, or the manufacture and sale in any Territory or the District of Columbia of adulterated or misbranded foods or drugs.¹ Thus it serves to protect the public health from injurious foods and the public pocketbook from falsely or fraudulently labeled foods and drugs, and to promote fair trade by guarding the honest manufacturer against unfair competition with misbranded or spurious articles sold under the guise of higher-priced commodities.

DOMESTIC FOODS.

In the law, the term "food" is not confined to those products which are commonly recognized as food for mankind, but includes also beverages (such as soft drinks and mineral water), confectionery, condiments, feeds for horses, cattle, and poultry, and substances like baking powder which enter into the preparation of foods. Nor

¹ The text of the Food and Drugs Act, and the rules and regulations for its enforcement, are printed in Circular 21, Office of the Secretary, U. S. Department of Agriculture.

does the law restrict the application of the term "adulterated" to foods containing an added poisonous or deleterious substance, such as milk preserved with formaldehyde, which might prove harmful to the consumer. Within the law, "adulterated" has a far wider significance, being applied as well to the following kinds of foodstuffs: (1) Those which are made wholly or in part from filthy or decomposed material, as in the case of catsup made from rotten tomatoes, or milk containing an excessive number of bacteria; (2) those which have been cheapened by the substitution in whole or in part of some less valuable material or one possessing no food value whatsoever, such as an article sold as coffee in which the coffee has been replaced wholly or partially by chicory, or cottonseed meal containing an excessive amount of cottonseed hulls; (3) those of an inferior grade made to simulate goods of better quality, for example, acetic acid which has been colored to look like cider vinegar; and (4) those from which certain valuable component parts have been removed, as skim milk offered for sale as whole milk.

Under the Federal Food and Drugs Act many cases are brought against manufacturers and shippers who violate the misbranding clauses of the law. Misbranding of food, which may be defined as the use of an untruthful or misleading label, includes the sin of omission as well as the sin of commission. Labeling a bottle of cottonseed oil "Olive Oil" is a typical sin of commission, while the manufacturer who fails to declare the weight of food in package form is guilty of the sin of omission. Shading from one of these types of violation to the other are many forms of misbranding.

Often labels are worded in strict accordance with the facts, but have the type so arranged or pictorial representations so employed that the purchaser receives an entirely erroneous impression as to the contents of the package. Deceptive labeling of this kind is considered to be in violation of the act.

Another all too common deception against the consuming public is food of short weight sold in package form. Prints of butter weighing from 14 to 15 ounces, but bearing no statement to indicate that they fall short of one pound, are representative of this type of fraud. The Bureau protects the purchaser against such practices by enforcing that section of the law which provides that a food shall be judged misbranded, "if in package form, the quantity of the contents be not plainly and conspicuously marked on the outside of the package in terms of weight, measure, or numerical count."

DOMESTIC DRUGS.

To secure the desired effect, it is imperative that all drugs used or prescribed by a physician shall be what he has every right to expect them to be, judging by their labels. If they are under or over the accepted standards, the Food and Drugs Act demands that their labels shall so specify.

In addition, the Food and Drugs Act covers medicines that are advertised and sold directly to the general public, the so-called "patent medicines." Under the law the presence in a preparation, and the amount in which they occur, of certain dangerous or habit-forming substances, enumerated in the act, must be made known upon the label. With this information at hand, the purchaser, of course, may exercise his own discretion in administering the product.

It is the duty of the Bureau of Chemistry also to see that labels on "patent medicines" hold out to the public no promise of benefit that is not fully justified by the composition of the preparation. As a standard for the determination of such questions, the Bureau has adopted the general consensus of opinion among the medical profession as to the usefulness and limitations of the various drugs. The labeling of medicinal preparations is judged not by the presence or absence of such terms as "remedy," "cure," and "treatment," but by the names of diseases and the impression conveyed by the wording to the average purchaser.

IMPORTED FOODS AND DRUGS.

Many food products, medicinal herbs, which for one reason or another can not be grown profitably in this country, and "patent medicines" are constantly being offered for importation into the United States. These are denied entry if they fail to conform to the general requirements of the Food and Drugs Act, are not in accord with the laws of the country of origin, or are otherwise dangerous to the health of the people of the United States. When circumstances warrant, relabeling or reconditioning of the goods may be allowed. If thereby a product meeting the requirements of the act is obtained, the goods are then permitted entry. The field stations maintained by the Bureau at certain ports of entry, as New York, Boston, New Orleans, and San Francisco (fig. 2), examine and analyze samples of shipments offered for entry into the United States which are suspected of being in violation of the Food and Drugs Act.

PROCEDURE.

Anyone found guilty, after trial in the Federal courts, of violating the provisions of the Food and Drugs Act, or who pleads guilty to such an offense, is subject to a fine, and, under certain circumstances, to imprisonment. The evidence necessary to prove a producer or shipper guilty is gathered and presented at the trial by the Bureau of Chemistry, through the Department of Justice. Sometimes the cooperation of State and city health, food, drug, and feeding stuffs officials is enlisted. Figure 1 shows each essential step in the development of a case as it progresses through the organization units of the Bureau of Chemistry and the Office of the Solicitor of the Department of Agriculture, the Department of Justice, and the courts.

An inspector of the Bureau (1) collects samples of a product suspected of being in violation of the act, and forwards them to the proper station for analysis. At the station an analysis is made (2) the results of which are sent by the station chief, with his recommendation as to the

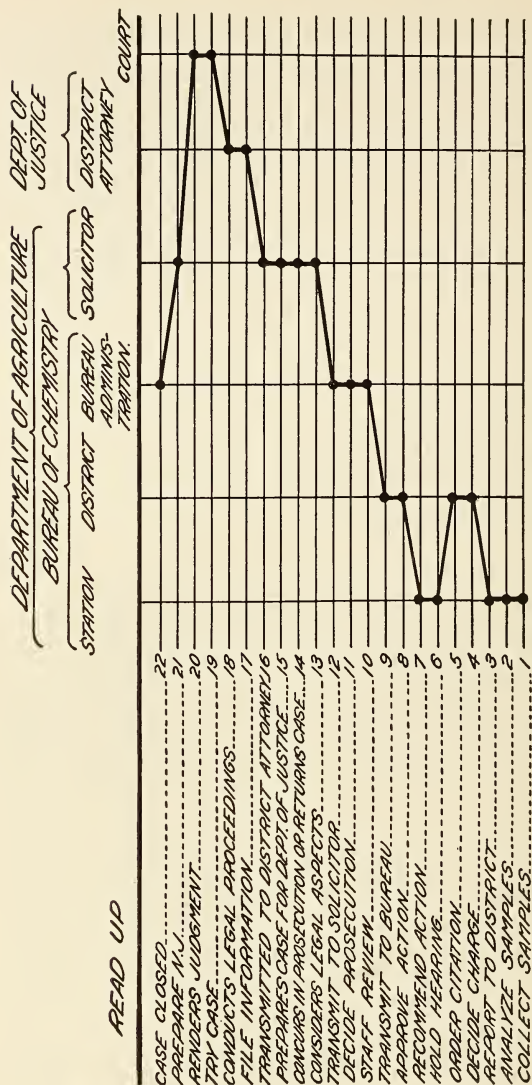


Fig. 1.—Course of a case under the Food and Drugs Act.

proper action to be adopted, to his district chief (3). If the district chief approves the station's recommendation (4), he instructs the station (5) to cite the manufacturer or shipper of the product in question to a hearing at the station headquarters, and at the same time submits a statement of the action taken to the chief of the Bureau in Washington. On the date set, the person cited reports for an oral hearing (6), or presents in writing his statement as to why the Government should not take further action.

After the hearing, the station chief prepares a summary of the findings which he forwards to the district chief, together with his recommendation as to the proper action to be taken (7). The district chief may indorse the recommendation as it stands or modify it (8), after which he sends all the papers in the case, accompanied by a statement of what he considers appropriate action, to the chief of the Bureau. The chief or assistant chief of the Bureau may then decide upon the next step, or may refer the matter (10) to the laboratory or office in Washington specializing in the product involved. If the specialist agrees with the recommendation of the district chief that prosecution proceedings should be instituted, the case is transmitted to the chief or assistant chief of the Bureau, with an indorsement of the recommendation for prosecution.

The case is then considered in the office of the chief and assistant chief (11), after which, if these officials concur in the recommendation made, it is sent to the Solicitor of the Department of Agriculture (12) to be examined as to its legal aspects. The Solicitor decides (13) who is liable in connection with the alleged violation, and determines whether or not the evidence at hand is sufficient to support prosecution. If he disagrees with the recommendation of the Bureau, he returns the papers to the Bureau for further consideration. If, however, he concurs in the Bureau's recommendation for prosecution (14), by authority of the Secretary of Agriculture, he prepares the papers necessary to be transmitted to the Department of Justice (15), where the case is next sent (16) for final transmittal to the district attorney who will try the case.

The district attorney (17) files the information or presents the case to the grand jury for indictment of the producer or shipper, and conducts the necessary legal proceedings (18). The court hears the case (19), with or without a jury, and renders judgment (20), imposing a sentence where the verdict is "guilty." Members of the Bureau of Chemistry often are summoned to serve as witnesses at such trials. After the termination of the case in court, a notice of judgment, giving the essential facts, is prepared

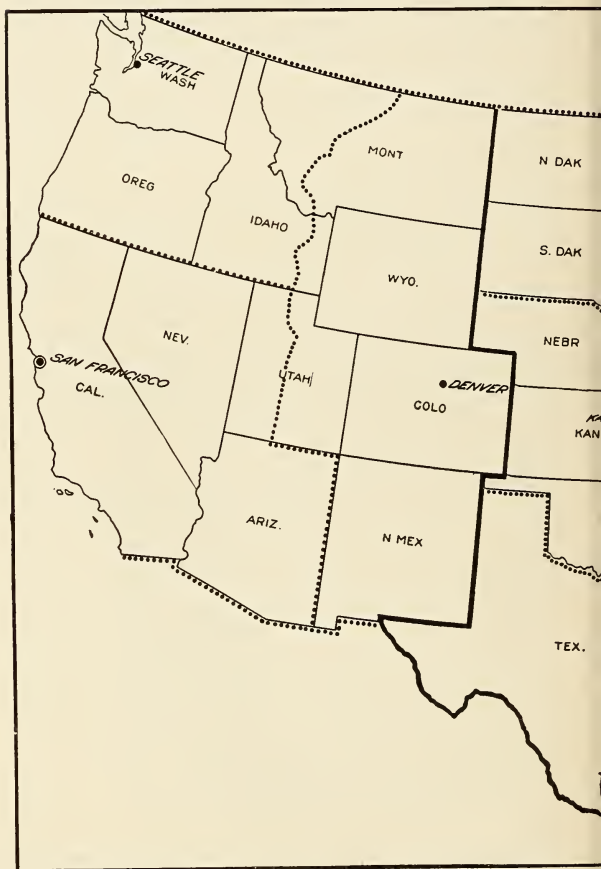
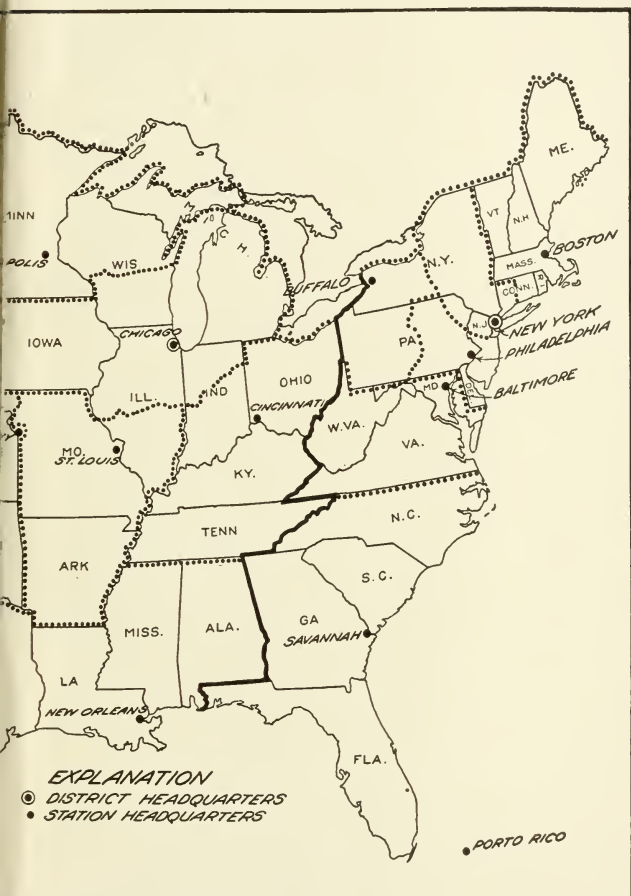


Fig. 2.—Food and drug inspection.

by the Solicitor (21), and later published by the Bureau. This terminates the case, and the records are closed (22).

Two forms of legal action may be instituted in the correction of violations of the Food and Drugs Act involving the shipment of domestic products. Sometimes a criminal prosecution is brought against the alleged offender. Again, goods which are being shipped contrary to the provisions of the law are seized under order of the court and removed from the channels of trade until a decision



as to what disposition should be made of them has been reached by the court. The Bureau officials base their decisions as to the type of action to be instituted upon the conditions connected with each case.

The procedure in connection with the enforcement of that section of the law relating to foods and drugs offered for importation into this country does not involve court action. The officials of the Division of Customs, of the Treasury Department, cooperate in this phase of the Bureau's regulatory work.

All foreign merchants are required to certify to certain facts concerning the foods and drugs which they desire to ship, before the proper United States consular officials. These certificates are attached to the invoices of the various products, and the Bureau of Chemistry inspectors are allowed to scrutinize all invoices of foods and drugs coming into this country. If an examination of the invoices and their accompanying certificates indicates that an article does not comply with the terms of the law, samples of it are taken for analysis, the entire shipment being held until the results of the examination are known. When goods are found to be in violation of the act, the importer is so informed, and an opportunity is given him to present to the Government his evidence as to why his product should not be denied entry. If the results of the hearing fail to convince the Bureau that the goods are in compliance with the law, a report is submitted to the collector of customs at the port of entry, who then refuses to admit the product in question into this country. If the importer is not satisfied with the action of the Bureau he may appeal to the Secretary of Agriculture. When, however, the case proves to be one of misbranding only, the articles usually may be brought in after the labels have been corrected. Another exception is made in the case of importers who, through no fault of their own, receive shipments of foods or drugs which are adulterated or misbranded, but not grossly. It is customary to release such goods after they have been relabeled, sorted, and cleaned, or denatured, provided an

article which fulfills the requirements of the law can thus be obtained. This privilege, of course, is not extended to persons who have abused it in the past or have requested it repeatedly.

COOPERATION WITH STATES AND CITIES.

Under the provisions of the Food and Drugs Act, the Bureau of Chemistry can exercise supervision only over foods and drugs entering interstate or foreign commerce, or made, sold, or offered for sale in the District of Columbia or the Territories of the United States. It has no power over those products which are made and sold within the confines of a single State. Most of the States, however, have food and drug laws similar in many respects to the Federal act, and designed to afford the same protection to the several States as the Federal act does to the nation at large. It is most desirable that the State and Federal officials charged with the enforcement of public health laws work together in harmony. To that end, the office of cooperation in the Bureau of Chemistry keeps the State food, drug, and feeding stuffs officials informed on matters pertaining to the administration of food and drug laws, both State and Federal, and provides a practical and effective system of cooperation among such officials. In this way the Bureau keeps in touch with 50 departments, including those in practically every State of the Union, the District of Columbia, Hawaii, Porto Rico, and the Philippine Islands. It provides them with information on matters of general interest relating to the administration of the Federal Food and Drugs Act, and secures their opinions on important questions under consideration by the Bureau in connection with the enforcement of the law.

FACTORY INSPECTION.

An increasingly important part of the Bureau of Chemistry's regulatory work is its factory inspection. So far as its limited force of inspectors will permit, the Bureau endeavors to conduct a systematic investigation of plants

where foods and drugs shipped in interstate commerce are made. As a result of such work, it frequently becomes possible for the Government, through its technical staff, to offer various manufacturers constructive advice which

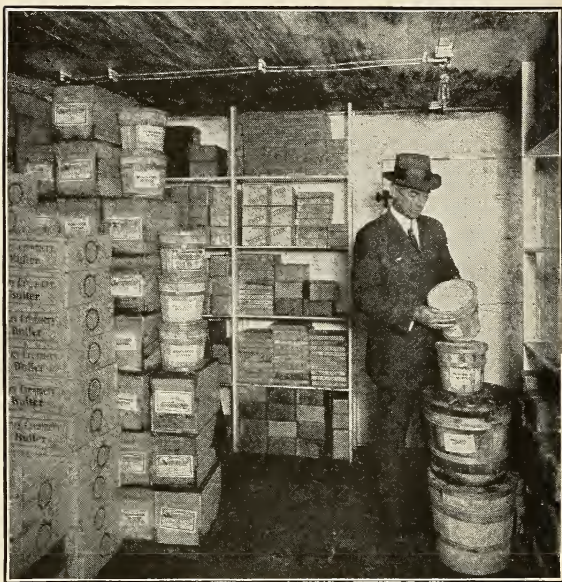


Fig. 3 —Food and drug inspector examining butter.

will enable them to remedy defects in their processes, thus improving the quality of their output and the efficiency of their operations, as well as bringing their goods into compliance with the law.

TEA INSPECTION.

In 1920, the Tea Inspection Service, formerly part of the United States Treasury Department, was transferred to the Department of Agriculture, upon the joint recommendation of the Secretary of the Treasury and the Secretary of Agriculture. As no duty is imposed on tea, and as the Bureau of Chemistry, under the Food and Drugs Act, is charged with the examination of all

imported foods and drugs, it was thought that the tea inspection work was more closely related to the Department of Agriculture than to the Treasury Department.

Tea is subject to the provisions of both the Food and Drugs Act and the Tea Inspection Act. While the Food and Drugs Act covers only adulteration or misbranding, the Tea Act provides for a physical standard of quality as well as purity.

The act to prevent the importation of impure or unwholesome tea, commonly known as the Tea Act, which was passed by Congress in 1897, and later amended, provides that the Secretary of Agriculture shall appoint each year a board of seven tea experts who shall select standards for tea. Such standards are distributed among the officials enforcing the law, and may be bought at cost by the tea trade and others interested.

It is the duty of the Supervising Tea Examiner, stationed in Washington, with the assistance of seven tea examiners and their assistants, stationed in various ports of entry, to see to it that no tea which falls below the standards fixed by the Secretary is permitted entry into the United States.

The importer of any tea which is rejected is given 30 days in which to appeal his case to the United States Board of Tea Appeals, composed of three employees of the Department of Agriculture, stationed in the city of New York. If the tea is rejected for quality, the Board of Tea Appeals summons witnesses from the trade, while if it is rejected for impurities the chemist's report, upon which the rejection was originally based, usually is accepted. No appeal may be made from the decision of the Board of Tea Appeals.

The law allows the importer six months in which to remove his rejected tea from this country. If not outside the limits of the United States by that time, it must be destroyed.

Tea waste, tea siftings, tea sweepings, and low-grade tea may be brought into the United States if they are to be used solely for technical manufacturing purposes.

The importer of such products, however, must give bond to the collector of customs that their identity will be destroyed in the process of manufacture.

RESEARCH WORK.

FOOD AND DRUG ANALYSIS.

To ascertain accurately when a food or drug is adulterated or misbranded, it is, of course, necessary to have suitable standards for comparison. Before the analyst can pass intelligently upon the samples submitted to him for examination, he must know the true composition of the articles which they purport to be. Consequently, a large part of the scientific force of the Bureau of Chemistry is engaged in the investigation of many natural products. Based upon the results thus obtained, the Department formulates definite standards for the guidance of the food and drug officials of the country and the manufacturers.

To illustrate, it was found that spices were being grossly adulterated and misbranded, and that it was difficult to determine when to prosecute cases involving such products. Accordingly, all the spices in common use have been studied physically, chemically, and microscopically. Using the results of this study as a foundation, fair standards for spices have been determined and published to serve as a basis for action in the enforcement of the law.

Such standards are published in Office of the Secretary Circular 136. New and tentative standards and informal opinions are made public through the Service and Regulatory Announcements of the Bureau.

INVESTIGATION OF COMMERCIAL METHODS.

To supplement this first type of research work, investigations are undertaken to perfect various processes used in the preparation of foods and drugs and to devise methods for the utilization of by-products hitherto wasted.

Much has been accomplished along this line in connection with the preparation of poultry and eggs for the market and their handling during storage and transportation. The results obtained have fully justified the Bureau's belief that some changes in methods and a careful attention to detail would add to the producer's profits, at the same time augmenting the country's food supply.

Extended studies also have been conducted to determine how certain fish, such as the sardine, might be packed to best advantage, and the by-products of the canneries salvaged.

Of great economic importance to the American fruit grower is the Bureau's project for working out ways to manufacture salable articles from the cull grapefruit, oranges, and lemons which too often constitute a total loss. To bring this about, methods are being devised whereby such culls may be converted into beverages, jam, marmalade, etc., for which a ready market exists.

INVESTIGATIONS IN AGRICULTURAL CHEMISTRY.

Along with the research work which is done in connection with the enforcement of the Food and Drugs Act go the investigations in the realm of agricultural chemistry that constituted the sole original function of the Bureau. The needs of the farmer still occupy an important place in this branch of the Federal service.

For example, the chemistry of plant growth is considered for the purpose of determining the effect of recognized plant food constituents and of the inorganic elements applied at different stages of the growth, as well as the effect of light, on the composition and physical characteristics of plants. The changes taking place during the growing period as the result of any particular treatment are investigated also.

The tanning of leather in its various aspects is studied, that the farmer may receive satisfactory instructions for preparing hides and for selecting with discrimination and intelligently caring for the leather which he uses for



Fig. 4.—One of the laboratories of the Bureau of Chemistry in Washington.

boots, harness, or belting. Instructions for the cheap and effective waterproofing and mildewproofing of fabrics for wagon covers, stack covers, tents, and tarpaulins have been published.

Under way also is a scheme for showing the farmer how he may utilize as stock food cull potatoes and other waste products of his land. It is thought that certain plants not now so employed may prove valuable as stock food. A study of the proteins which they contain is being made to see whether this can be done.

As soon as it became evident that fires and explosions in thrashers and in grain elevators and mills might be due to the accumulation, under certain conditions, of grain dusts, the Bureau launched its grain-dust-explosion-prevention campaign for the benefit of the farmer, the thrasher, and the miller. The causes of such fires and explosions have been studied and the results made public. Preventive devices have been perfected and tested, and owners and operators of thrashing machines, mills, and grain elevators told how to install devices and adopt simple precautionary measures which should go a long way toward safeguarding their property.

COLLABORATION WITH OTHER DEPARTMENTS.

Because of the Bureau's fitness, in the matter of both personnel and equipment, for conducting chemical, microscopical, and microbiological examinations, many of the other Government departments and bureaus have acquired the habit of turning over to it certain parts of various problems coming within their jurisdiction.

For example, the Post Office Department submits for analysis samples of drugs, cosmetics, depilatories, "fat producers," "fat reducers," food suspected of containing poisons, and other material going through the United States mails which is believed to be fraudulent or harmful. The Treasury Department enlists the aid of the Bureau of Chemistry in devising currency paper which is difficult to counterfeit and at the same time is as

serviceable as possible. Many samples of foodstuffs and other supplies for the Army are submitted by the office of the Quartermaster General of the Department of War for analysis by the Bureau.

Added to these duties are the working out of new analytical methods and the perfecting of old ones, upon which the Bureau is constantly engaged. These results are published from time to time, that they may be of service to commercial and Government chemists alike.

COLOR INVESTIGATIONS.

Color research work was begun many years ago in the Bureau of Chemistry, for the reason that various types of dye materials are agricultural products and also because the largest users of dyes are the industries utilizing raw agricultural materials. Moreover, the Bureau has been called upon to study very extensively the artificial (coal-tar) dyes, on account of their wide use to color food products.

When, therefore, shortly after the outbreak of the recent Great War, Congress thought it advisable for the Government to assist in the development of a domestic dye industry, the experience thus gained by the Bureau of Chemistry made it particularly well equipped to undertake the work.

The color laboratory considers chiefly the fundamental principles that underlie the mechanism of the reactions which enter into the production of dyes, and determines the chemical and physical constants of the materials used in the industry. The factory chemist rarely has time to devote to this type of work, and, when he is in a position to carry it on, keeps secret the results which he obtains. The findings of the Government, on the other hand, are made public as rapidly as possible, for the advancement of the entire American dye industry.

OFFICE OF DEVELOPMENT WORK.

The practical application in the industries and in the arts of the results of scientific research is quite apart from the actual carrying out of an investigation. That the industrial world may have the full benefit of all such results obtained in the Bureau of Chemistry, an office has been established to serve as the connecting link between the Government and the manufacturer or other interested person. This office, known as the Office of Development Work, assumes charge of the results of any given fundamental project of the Bureau as soon as it reaches the stage where it gives promise of being ready for industrial development. The Office of Development Work, of course, handles only discoveries made in the Bureau of Chemistry.

PUBLICATIONS.

Reports of the results of the Bureau's work are issued from time to time. Some take the form of Department of Agriculture bulletins or circulars, a list of which may be had on application to the Bureau, while others, which, it is believed, will be of interest chiefly to some particular class of readers or to a certain industry, appear in the scientific and trade journals of the country.





